F4 Age Estimation of a Sample of 12-15-Year-Old Subjects by a Morphometric Analysis of the Development of the Second Mandibular Molar

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The goal of this presentation is to demonstrate a contribution of age determination through the observation of digital orthopantomographs (OPT).

This presentation will impact the forensic community and/or humanity by demonstrating a useful instrument for the determination of the age of the crime perpetrator without a valid identification document.

The verification of age requested by the Law Authorities represent a useful instrument for the determination of liability of the crime perpetrator without valid identification document.

According to the Italian law, until the age of 14 a minor cannot be charged; while between 14 and 18 years of age the charges are examined in the capacity of the intention and will of the subject in the moment that he or she has committed the crime.

The objective of this research has been to demonstrate a contribution to age determination through the observation of digital orthopantomographs (OPT).

Only the second mandibular molars were considered as study objects (which complete their development around 15-16 years).

The choice of digital technology results from several considerations:
• 1:1 ratio between object and radiographic image
• processing and enlargement of details
• images clearer than the classic technique (especially anterior teeth and apicies)
• false images reduction
• lower exposition time

The research on the OPT was based on a morphometric criterion, which consist in the description, in terms of quantity, of the object's form, expressing mathematical equivalents (numbers) that result from the observation of the object considered.

This method avoids the risks of the morphological technique (traditional) that is subjective and can produce very different results because of the variety of the techniques adopted by the examiners.

The morphological analysis expresses dimensions of the crown and the root as fractions of a final unpredictable size; by morphometric analysis, it is possible to recognize an average dimensional crown–root ratio (with a standard deviation) that could guarantee objectivity to the study.

Only second mandibular molars were considered which allow better radiographic definition without clinical defects of development.

A specific dental software was used for image acquisition, processing and measurement.

This study's method comes from Holtta and Jepsen's previous studies; they both consider the cementum-enamel junctions as landmarks. The observers found the two junctions and with a straight line created two other parallel straight lines; the first one tangent to the highest cusp, the second one tangent to the apex of longest root (or the most apical part of the calcified root in the development phases). To these three lines a perpendicular was added on which the measurements were effected.

In the first phase, this technique was applied to 104 molars with completely developed roots, measuring the crowns and the roots and obtaining a ratio C/R. The average of these 104 ratios was 0.432 ± 0.048 (Standard Deviation).

This average has been used, in the second phase, to predict the value of the total root expected, after measuring the crown and the root in teeth not yet completely in 104 OPT (51 males – 53 females) all between 12 and 15 year-old subjects.

Then the ratio between the partial root and the expected one was determined with a standard deviation and a confidence interval (95%) for both sexes and all ages (12-15).

Concluding, a ratio between C/R of second completely developed mandibular molars was determined from which an estimated reference value (± S.D. and Conf.Int.) for every age and sex was created.

In this sample it was found that males of 12 and 13 years have the same average with a confidence interval very similar; the same for females of 13 and 14 years. These facts show a slowing down of the development; so it must be considered that increasing the sample, standard deviation was obtained and a confidence interval reduction with more precise results.

This method allows the assignment of a number to any class of age that comes from a statistical

investigation based on objective criteria.

Age Identification, Second Molar, Forensic Odontology